AMENDMENTS

IN THE CLAIMS:

1. (Currently Amended) An apparatus for encoding k consecutive input bits indicating a TFCI (Transport Format Combination Indicator) of ~~each of successively transmitted frames~~ into a sequence of m symbols in an NB-TDD (Narrowband-Time Division Duplex) mobile communication system, comprising:

an encoder for encoding the k input bits into a sequence of at least 2^n symbols where $2^n>m$, using an extended Reed-Muller code ~~from a Kasami sequence~~; and

a puncturer for performing puncturing on the sequence of 2^n symbols from the encoder so as to output a sequence of m symbols.

2. (Currently Amended) The apparatus as claimed in claim 1, wherein the encoder comprises:

a 1-bit generator for generating a sequence of same symbols;

a ~~base~~ basis orthogonal sequence generator for generating a plurality of ~~base~~ basis orthogonal sequences;

a ~~base~~ basis mask sequence generator for generating a plurality of ~~base~~ basis mask sequences; and

an operator for receiving the TFCI including a first information part indicating conversion to a biorthogonal sequence, a second information part indicating conversion to an orthogonal sequence and a third information part indicating conversion to a mask sequence, and generating the sequence of 2^n symbols by combining an orthogonal sequence selected from the ~~base~~ basis orthogonal sequences by the second information part, a biorthogonal sequence constructed by a combination of the selected orthogonal

sequence and the same symbols selected by the first information part, and a mask sequence selected by the third information part.

3. (Original) The apparatus as claimed in claim 1, wherein the encoder creates a (64,10) code.

4. (Currently Amended) The apparatus as claimed in claim 2, wherein the ~~base~~ basis orthogonal sequences include a 1st Walsh code, a 2nd Walsh code, a 4th Walsh code, an 8th Walsh code, a 16th Walsh code and a 32nd Walsh code, selected from 64 orthogonal sequences of length 64.

5. (Currently Amended) The apparatus as claimed in claim 2, wherein the ~~base~~ basis mask sequences include a 1st mask sequence of 00110101011011111010001100000110111101100101001110011111111000101, a 2nd mask sequence of 01000111110100011110110101110110111101100010010110100011011100O, and a 4th mask sequence of 00011000111001111101010011010100101111011011110101110001100011l0.

6. (Currently Amended) The apparatus as claimed in claim 2, wherein the operator comprises:

a first multiplier for multiplying the same symbols by the first information part;

a plurality of second multipliers for multiplying the ~~base~~ basis orthogonal sequences by TFCI bits constituting the second information part;

a plurality of third multipliers for multiplying the ~~base~~ basis mask sequences by TFCI bits constituting the third information part; and

an adder for generating the sequence of 2^n symbols by adding outputs of the first to third multipliers.

7. (Original) The apparatus as claimed in claim 2, wherein the puncturer performs puncturing according to any one of puncturing patterns given below:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

8. (Currently Amended) An apparatus for encoding k consecutive input bits indicating a TFCI ~~of each of successively transmitted frames~~ into a sequence of m symbols in an NB-TDD mobile communication system, comprising:

an orthogonal sequence generator for creating a plurality of biorthogonal sequences having a length of at least 2^n where $2^n>m$, and outputting a biorthogonal sequence selected from the biorthogonal sequences by first information bits of the TFCI;

a mask sequence generator for creating a plurality of mask sequences, ~~whose minimum distance by a sum of the mask sequences and the biorthogonal sequences is at least 20, using a Kasami sequence,~~ and outputting a mask sequence selected from the mask sequences by second information bits of the TFCI;

an adder for adding a biorthogonal sequence from the orthogonal sequence generator and a mask sequence from the mask sequence generator; and

a puncturer for performing puncturing on the sequence of 2^n symbols from the adder so as to output the sequence of m symbols.

9. (Original) The apparatus as claimed in claim 8, wherein the puncturer performs puncturing according to one of following puncturing patterns:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

10. (Currently Amended) An apparatus for encoding k consecutive input bits indicating a TFCI ~~of each of successively transmitted frames~~ into a sequence of m symbols in an NB-TDD mobile communication system, comprising:

a 1-bit generator for continuously generating same symbols;

an orthogonal sequence generator for creating first sequences having a length m by puncturing a plurality of ~~base~~ basis orthogonal sequences having a length of at least 2^n where 2^n>m, according to a predetermined puncturing pattern;

a mask sequence generator for creating second sequences having a length m by puncturing ~~base~~ basis mask sequences having a length of at least 2^n where 2^n>m;

a plurality of multipliers provided in association with input TFCI bits, for multiplying the same symbols, the first sequences and the second sequences by associated TFCI bits; and

an adder for adding output sequences of the multipliers and outputting ~~a symbol~~ the sequence of 48 symbols~~sequence indicating the TFCI~~.

11. (Currently Amended) The apparatus as claimed in claim 10, wherein the ~~base~~ basis orthogonal sequences include a 1st Walsh code, a 2nd Walsh code, a 4th Walsh code, an 8th Walsh code, a 16th Walsh code and a 32nd Walsh code, selected from orthogonal sequences of length 64.

12. (Currently Amended) The apparatus as claimed in claim 10, wherein the ~~base~~ basis mask sequences include a 1st mask sequence of 00110101011011111010001100000110111101100101001110011111111000101, a 2nd mask sequence of 01000111110100011111011010111101101111011000100101101000110111000, and a 4th mask sequence of 00011000111001111101010011010100101111011011110101110001100011110.

13. (Original) The apparatus as claimed in claim 10, wherein the predetermined puncturing pattern is one of following puncturing patterns:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

14. (Currently Amended) A method for encoding k consecutive input bits indicating a TFCI of each ~~of successively transmitted frames~~ into a sequence of m symbols in an NB-TDD mobile communication system, comprising:

encoding the k input bits into a sequence of at least 2^n symbols where $2^n>m$, using an extended Reed-Muller code ~~from a Kasami sequence~~; and

performing puncturing on the sequence of 2^n symbols so as to output a sequence of m symbols.

15. (Currently Amended) The method as claimed in claim 14, wherein the encoding step comprises the steps of:

generating a sequence of same symbols;

generating a plurality of ~~base~~ basis orthogonal sequences;

generating a plurality of ~~base~~ basis mask sequences; and

receiving the TFCI including a first information part indicating conversion to a biorthogonal sequence, a second information part indicating conversion to an orthogonal sequence and a third information part indicating conversion to a mask sequence, and generating the sequence of 2^n symbols by combining an orthogonal sequence selected from the ~~base~~ basis orthogonal sequences by the second information part, a biorthogonal sequence constructed by a combination of the selected orthogonal sequence and the same symbols selected by the first information part, and a mask sequence selected by the third information part.

16. (Currently Amended) The method as claimed in claim 15, wherein the ~~base~~ basis orthogonal sequences include a 1^{st} Walsh code, a 2^{nd} Walsh code, a 4^{th} Walsh code, an 8^{th} Walsh code, a 16^{th} Walsh code and a 32^{nd} Walsh code, selected from 64 orthogonal sequences of length 64.

17. (Currently Amended) The method as claimed in claim 15, wherein the ~~base~~ basis mask sequences include a 1^{st} mask sequence of 00110101011011111010001100000110111101100101001110011111111000101, a 2^{nd} mask sequence of 01000111110100011101101011110110111101100010010110100011011100 0, and a 4^{th} mask sequence of 00011000111001111010100110101001011110110111101011100011000111 0.

18. (Original) The method as claimed in claim 14, wherein the puncturing is performed according to any one of puncturing patterns given below:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

19. (Currently Amended) A method for encoding k consecutive input bits indicating a TFCI of each of successively transmitted frames into a sequence of m symbols in an NB-TDD mobile communication system, comprising:

creating a plurality of biorthogonal sequences having a length of at least 2^n where 2^n>m, and outputting a biorthogonal sequence selected from the biorthogonal sequences by first information bits of the TFCI;

creating a plurality of mask sequences, ~~whose minimum distance by a sum of the mask sequences and the biorthogonal sequences is at least 20, using a Kasami sequence represented by a sum of two m-sequences,~~ and outputting a mask sequence selected from the mask sequences by second information bits of the TFCI;

adding the selected biorthogonal sequence and the mask sequence; and

performing puncturing on the sequence of 2^n symbols so as to output the sequence of m symbols.

20. (Original) The method as claimed in claim 19, wherein the puncturing is performed according to one of following puncturing patterns:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

21. (Currently Amended) A method for encoding k consecutive input bits indicating a TFCI of ~~each~~ of successively transmitted frames into a sequence of m~~48~~ coded symbols in an NB-TDD mobile communication system, comprising:

continuously generating same symbols;

creating first sequences having a length m by puncturing a plurality of ~~base~~ basis orthogonal sequences;

creating second sequences having a length m by puncturing ~~base~~ basis mask sequences;

multiplying the same symbols, the first sequences and the second sequences by associated TFCI bits; and

adding the resulting sequences calculated by the multiplication and outputting the sequence of m symbols.

22. (Currently Amended) The method as claimed in claim 21, wherein the ~~base~~ basis orthogonal sequences include a 1st Walsh code, a 2nd Walsh code, a 4th Walsh code, an 8th Walsh code, a 16th Walsh code and a 32nd Walsh code, selected from orthogonal sequences of length 64.

23. (Currently Amended) The method as claimed in claim 21, wherein the ~~base~~ basis mask sequences include a 1st mask sequence of 00110101011011111010001100000110111101100101001110011111111000101, a 2nd mask sequence of 01000111110100011110110101111011011110110001001011010001101110000, and a 4th mask sequence of 00011000111001111101010011010100101111011011110101110001100011110.

24. (Original) The method as claimed in claim 21, wherein the predetermined puncturing pattern is one of following puncturing patterns:

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

{0, 4, 8,13,16,21,25,28,32,37,43,44,49,52,56,62}

{0, 4, 8,13,16,21,25,31,32,37,43,44,49,52,56,61}

{0, 4, 8,13,18,21,25,30,35,36,40,46,50,53,57,62}

{0, 4, 8,13,18,21,25,30,35,37,40,47,50,53,57,62}

{0, 4, 8,13,19,22,27,30,33,36,41,44,49,55,58,61}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,56,63}

{0, 4, 8,13,19,22,27,30,33,36,41,44,50,52,58,61}

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}

25. (Currently Amended) An apparatus for encoding 10 consecutive input bits indicating a TFCI of each ~~of successively transmitted frames into a sequence of~~ 48 symbols in an NB-TDD mobile communication system, comprising:

a (64,10) second order Reed Muller code generator for generating 64 coded symbols by using length 64 Walsh codes and length 64 masks in response to the input bits; and

a puncturer for puncturing 16 symbols out of the 64 coded symbols wherein puncturing positions of the 16 symbols are as follows;

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}.

26. (Currently Amended) An apparatus for encoding 10 consecutive input bits indicating a TFCI ~~of each of successively transmitted frames~~ into a sequence of 48 symbols in an NB-TDD mobile communication system, comprising:

a (48,10) code generator for generating 48 coded symbols by using length 48 codes which are punctured codes of length 64 Walsh codes and length 48 masks which are punctured codes of length 64 masks,

wherein the punctured codes of length 64 Walsh codes and masks are a set of codes generated by puncturing following positions out of the length 64 Walsh codes and masks;

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}.

27. (Currently Amended) A method for encoding 10 consecutive input bits indicating a TFCI ~~of each of successively transmitted frames~~ into a sequence of 48 coded symbols in an NB-TDD mobile communication system, comprising:

~~creating~~generating first sequences having a length 48 punctured orthogonal sequences;

~~creating~~generating second sequences having a length 48 punctured mask sequences;

multiplying the first sequences with each associated TFCI bit and the second sequences with each associated TFCI bit; and

adding each resulting sequences calculated by the multiplication and outputting the sequence of 48 symbols,

wherein the punctured orthogonal sequences and the punctured mask sequences are sequences generated by puncturing following positions out of length 64 Walsh codes and length 64 masks;

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}.

28. (New) An apparatus for encoding 10 consecutive input bits indicating a TFCI(Transport Format Combination Indicator) into a sequence of 48 coded symbols in

an NB-TDD(Narrowband-Time Division Duplex) mobile communication system, comprising:

a orthogonal sequence generator for generating first sequences having a length 48 punctured orthogonal sequences;

a mask sequence generator for generating second sequences having a length 48 punctured mask sequences;

a plurality of multipliers being associated with TFCI bits for multiplying the associated TFCI bits by the first sequences or the second sequences; and

an adder for adding output sequences of the multipliers and outputting the sequence of 48 symbols,

wherein the punctured orthogonal sequences and the punctured mask sequences are sequences generated by puncturing following positions out of length 64 Walsh codes and length 64 masks;

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}.

29. (New) A method for encoding 10 consecutive input bits indicating a TFCI of each 48 symbols in an NB-TDD mobile communication system, comprising the step of:

second order Reed Muller coding for generating 64 coded symbols by using length 64 Walsh codes and length 64 masks in response to the input bits; and

generating 48 symbols by puncturing 16 symbols out of the 64 coded symbols wherein puncturing positions of the 16 symbols are as follows;

{0, 4, 8,13,16,20,27,31,34,38,41,44,50,54,57,61}.

30. (New) The method as claimed in claim 29, wherein the Walsh codes include a 1st Walsh code, a 2nd Walsh code, a 4th Walsh code, an 8th Walsh code, a 16th Walsh code and a 32nd Walsh code, selected from 64 Walsh orthogonal sequences of length 64.

31. (New) The apparatus as claimed in claim 26, wherein the masks include a 1st mask sequence of 00110101011011111010001100000110111101100101001110011111111000101, a 2nd mask sequence of 01000111110100011110110101111011011110110001001011010001101110000, and a 3rd mask sequence of 00011000111001111101010011010100101111011011110101110001100011110, wherein said basis mask sequences are selected from mask sequences made by using a Kasami sequence according linear independent property.